CLAIMS

1. A magnetostrictive torque sensor, comprising:

a rotating shaft rotating around a center axis and having magnetostrictive characteristics; and

a cylindrical ferrite magnetic core disposed at a predetermined distance from an outer periphery of the rotating shaft and coaxially with the rotating shaft, and provided with a coil having an insulation coating to detect a strain of the rotating shaft on its inner peripheral surface;

wherein:

the cylindrical ferrite magnetic core comprises a pair of opposed coil-forming inner peripheral surfaces formed by dividing the inner peripheral surface into two parts along a plane including the center axis; and

the coil has, on each of a pair of the opposed coil-forming inner peripheral surfaces, a first coil including a forward current coil and a feedback current coil connected in series and disposed at a same position inclined with an angle of +45° to the center axis, adapted to flow a forward current and a feedback current in a same direction and, and a second coil including a forward current coil and a feedback current coil connected in series adapted to flow a forward current and a feedback current in a same direction, and disposed at a same position inclined with an angle of -45° to the center axis and crossing with the first coil.

2. The magnetostrictive torque sensor, according to claim **1**, wherein:

the cylindrical ferrite magnetic core includes a pair of semi-cylindrical ferrite magnetic cores divided into two parts along a plane including the center axis.

3. The magnetostrictive torque sensor, according to claim **1**, wherein:

the forward current coil and the feedback current coil of the first and second coils include forward current coils and feedback current coils, which are continuously extended by horizontal conductors and vertical conductors.

4. The magnetostrictive torque sensor, according to claim **3**, wherein:

the horizontal conductors and the vertical conductors of the first and second coils are adapted to flow currents in different directions at a same position.

5. The magnetostrictive torque sensor, according to claim **1**, wherein:

the first and second coils are formed in a shape of zigzag on front and back surfaces of a flexible board, and formed by folding this flexible board with an angle of 180°.

6. The magnetostrictive torque sensor, according to claim **2**, wherein:

the first and second coils are connected between a pair of the semi-cylindrical ferrite magnetic cores to compose the bridge circuit.

7. The magnetostrictive torque sensor, according to

claim **1**, wherein:

the first and second coils respectively comprises a first terminal connected to a first and second terminals of an oscillator, and a second terminal connected to a terminal for strain detection to compose the bridge circuit.

8. The magnetostrictive torque sensor, according to claim **7**, wherein:

a differential signal from the bridge circuit is detected by the lock-in amplifier.

9. The magnetostrictive torque sensor, according to claim **1**, wherein:

the first and second coils are accommodated in grooves formed on a pair of the opposed coil-forming inner peripheral surfaces.

10. The magnetostrictive torque sensor, according to claim **9**, wherein:

a pair of the opposed coil-forming inner peripheral surfaces has a length L and a semi-circumference length P of the inner peripheral surface expressed as:

$L \fallingdotseq \pi D/2N$ $(N=1,2,3...)$, and

$P \fallingdotseq \pi D/2$

wherein D is a diameter of the rotating shaft, and

a distance G between adjacent grooves at both ends expressed as:

$G \fallingdotseq \pi D/4N$ $(N=1,2,3...)$.